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UNITED STATES PATENT OFFICE.

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PROPELLANT POWDER AND PROCESS OF MAKING THE SAME.

No Drawing. Original application filed June 20, 1924, Serial No. 721,203. Divided and this application filed October 12, 1925. Serial No. 62,090.

This invention relates to progressive powders, and more particularly to progressive burning propellant powders adapted for use in small arms such as shot guns. This application is a division of my application Serial Number 721,203, filed June 20, 1924.

The rate of burning of a powder grain is dependent upon its density. Thus a nitro-cellulose powder grain of comparatively low density, such as the bulked smokeless powder described in my Patent No. 1,627,861, issued May 10, 1927, or even ordinary bulk smokeless powder, has a higher rate of burning than, for instance, condensed colloided nitro-cellulose powder.

One of the objects of this invention, therefore, is to provide a progressive burning powder consisting of blended grains, the densities of which are so chosen as to cause a blended charge thereof to burn progressively.

Another object is to provide a progressive burning powder consisting of blended portions, in which each portion has a grain density and composition which is different from that of the other, the characteristics of the several portions being so chosen as to cause a blended charge thereof to burn progressively.

Further objects will appear from the detail description in which will be disclosed an illustrative embodiment of this invention.

In accordance with this invention a powder is produced by selecting powder portions so that the grains of the several portions burn at progressively decreasing rates and the portions so chosen are then blended in the desired proportions so as to produce the desired progressive burning of a blended charge. While the grain densities of the same portion may be substantially the same, the grain densities of the several portions vary progressively in accordance with the desired progressive action of a blended charge.

In accordance with an embodiment of this invention, the rate of burning is controlled by proper selection of the grain density. Thus by proper selection of, for instance, a portion of dense colloided nitro-cellulose powder and a portion of bulk smokeless powder, or a bulked nitro-cellulose powder, such, for instance, as described in my Patent No. 1,627,861, the desired progressive burning action may be obtained. The following is an

example of a rifle powder in which the grains may be of uniform size and the base nitro-cellulose:

80% high nitration powder—coated with 9% dinitro-toluene.

10% low nitration powder—coated with 5% dinitro-toluene.

10% low nitration powder—uncoated.

The above blended mixture produces velocities equal with the first 80% component of the mixture above, but with a smaller charge. It is also adapted for shot shells, providing granulations suitable for shot shell powders are selected.

In accordance with this invention, therefore, the progressive burning action is produced by proper selection of the grain densities of the portions of the blended charge; and by the proper selection of the proportions of the charge portions the desired progressive burning can be obtained. In accordance with this invention the more rapid burning powders impart their energy directly to the slower burning constituents of the mixture and there is no localizing of pressure but rather a uniform increase in the rate of burning which in turn imparts a sustained drive to the projectile.

It will be noted that in the example given, not only has each portion a grain density which is different from that of the other, but the composition of each portion is also different from that of the other. Accordingly, by proper selection of both grain densities and compositions of the portions of the blended charge and by proper selection of the proportions of the charge portions, the desired progressive burning can be obtained.

While in the specification and claims the term "grain" is used, it is to be understood that it is intended as a word of general description and not of limitation, but to include the various forms in which powder is produced for use. It will be further understood that while theories of formation and operation have been advanced, the invention is not necessarily limited thereto. It will further be obvious that various changes may be made in details without departing from the spirit of this invention; it is, therefore, to be understood that this invention is not to be limited to the specific details described.

Having thus described the invention, what is claimed is:

1. A progressive burning powder consisting of blended grains, the densities of which are so chosen as to cause a blended charge thereof to burn progressively.
- 5 2. A progressive burning powder consisting of blended portions, each portion having a grain density which is different from that of the other, the densities of the grains of the several portions being so chosen as to
10 cause a blended charge thereof to burn progressively.
3. A progressive burning powder consisting of blended portions, the densities of the grains of each portion being substantially the
15 same but the grain densities of the several portions being so chosen as to cause a blended charge thereof to burn progressively.
4. A progressive powder consisting of
20 blended portions, each portion having a grain density which is different from that of the other, the densities of the grains of the several portions being so chosen as to cause a blended charge thereof to burn progressively.
- 25 5. A progressive burning powder consisting of blended portions, each portion having a grain density and composition which is different from that of the other, the characteristics of the several portions being so
chosen as to cause a blended charge thereof
30 to burn progressively.
6. The process of making progressive burning powder consisting in blending powder portions in which the density of each portion
is different from that of the other and so
35 choosing the densities of the grains of the several portions as to cause a blended charge thereof to burn progressively.
7. The process of making progressive burning powder consisting in blending portions
40 in which the density of each portion is different from that of the other and so choosing the densities of the grains of the several portions and the relative proportions of these
portions as to cause a blended charge thereof
45 to burn progressively.
8. The process of making progressive powder consisting in selecting powder portions
50 so that the grains of the several portions are of progressively increasing densities and blending the portions.

In testimony whereof I affix my signature
this 25th day of August, 1925.

ARTHUR S. O'NEIL.